ES.1 MONITORING PROGRAM OBJECTIVES

The major objectives of the monitoring program outlined in the Municipal Stormwater Permit are to:

- Assess compliance with the Municipal Stormwater Permit CAS004001
- Measure and improve the effectiveness of the Stormwater Quality Management Program (SQMP)
- Assess the chemical, physical, and biological impacts of receiving waters resulting from urban runoff
- Characterize stormwater discharges
- Identify sources of pollutants
- Assess the overall health and evaluate long-term trends in receiving water quality

Ultimately, the results of the monitoring requirements should be used to refine the SQMP for the reduction of pollutant loads and the protection and enhancement of the beneficial uses of the receiving waters in Los Angeles County. The monitoring program was designed to address these objectives through the implementation of several elements:

- Core monitoring, including:
  - Mass emission monitoring
  - Water column toxicity monitoring
  - Tributary monitoring
  - Shoreline monitoring
  - Trash monitoring
- Regional monitoring, including:
  - Estuary sampling
  - Bioassessment
- Three special studies, including:
  - The New Development Impacts Study in the Santa Clara Watershed
  - The Peak Discharge Impact Study
  - The Best Management Practice (BMP) Effectiveness Study

ES.2 SUMMARY OF MONITORING RESULTS

ES.2.1 Core Monitoring

ES.2.1.1 Mass Emission Monitoring

The purpose of mass emission monitoring is to:

- Estimate the mass emissions from the Municipal Separate Storm Sewer System (MS4);
- Assess trends in the mass emissions over time; and
- Determine if the MS4 is contributing to exceedance[1] of water quality standards by comparing results to applicable standards in Water Quality Control Plan for the Los Angeles Region (Basin Plan), the California Toxics Rule (CTR), and with emissions from other discharges.

Flows were measured and water quality samples were taken at the following seven mass emission monitoring sites:

- Ballona Creek (S01)
- Malibu Creek (S02)
- Los Angeles River (S10)
- Coyote Creek (S13)
- San Gabriel River (S14)
- Dominguez Channel (S28)
- Santa Clara River (S29)

All mass emission sites, except the Santa Clara River site, are equipped with automated samplers with integral flow meters for collecting flow composite samples. A minimum of three storm events, including the first storm, and two dry weather events were sampled at each mass emission site. Total Suspended Solids (TSS) were collected from four storm events at the Santa Clara River mass emission site; 10 storm events at San Gabriel River, Ballona Creek, Malibu Creek, Dominguez Channel, and Los Angeles River mass emission sites, and 11 storm events at the Coyote Creek mass emission site.

Based on results of the mass emission monitoring, three different water quality analyses were conducted.

- A comparison to applicable water quality standards;

[1] Exceedance of water quality standards is assumed when numeric water quality objectives are not attained.

- An analysis of pollutant loads and trends; and
- An evaluation of the correlation between constituents of concern and TSS.

Summaries of the analyses follow.

ES.2.1.1.1 Comparison Study for Mass Emission Water Quality

Monitoring results were compared to indicators of water quality based on water quality objectives established by the Basin Plan and the CTR. The Basin Plan is designed to enhance water quality and protect the beneficial uses of all regional waters. The CTR promulgates criteria for priority toxic pollutants in the State of California for inland surface waters and enclosed bays and estuaries.

Two categories of water quality objectives were identified: Category 1 and Category 2. Category 1 water quality objectives (see table below) are those for which there is no uncertainty about the applicable objectives, or the implementation with respect to frequency and duration. Category 2 water quality objectives are those for which there is uncertainty about the applicability of the beneficial use (e.g., the conditional use of municipal water supply), or uncertainty about implementation of the objective (e.g., 4-day averaging periods).

The numeric objectives in the table below that are listed as ranges are calculated values based on site specific conditions. Ammonia concentrations are calculated using measured pH and Tables 3-1 (COLD) and 3-2 (WARM) of the Basin Plan, assuming a temperature of 25 °C (for COLD) and 20 °C (for WARM). Dissolved metals concentrations are calculated using measured hardness and procedures set forth in the CTR. The ranges shown reflect calculated objectives for the period of 2006 through 2009 at all mass emission and tributary stations.

Category 1 Numeric Objectives Used to Evaluate Attainment of Water Quality Standards

Constituent	Numeric Objective	Unit	Reference	Beneficial Use
Chloride	Ballona Creek (S01) None Malibu Creek (S02) < 500 Los Angeles River (S10) < 150 Coyote Creek (S13) None San Gabriel River (S14) < 150 Dominguez Channel (S28) None Santa Clara River (S29) < 150	mg/L	Basin Plan	Groundwater recharge (GWR), general water quality indicators
Sulfate	Ballona Creek (S01) None Malibu Creek (S02) < 500 Los Angeles River (S10) < 350 Coyote Creek (S13) None San Gabriel River (S14) < 300 Dominguez Channel (S28) None Santa Clara River (S29) < 600	mg/L	Basin Plan	
TDS	Ballona Creek (S01) None Malibu Creek (S02) < 2,000 Los Angeles River (S10) < 1,500 Coyote Creek (S13) None San Gabriel River (S14) <750 Dominguez Channel (S28) None Santa Clara River (S29) < 1,200	mg/L	Basin Plan	
pH	6.5 - 8.5	None	Basin Plan	Aquatic life habitat (WARM, COLD)
DO	(All) > 5 (WARM) (Malibu Creek) > 6 (COLD) (Malibu Creek) > 7 (SPAWN)	mg/L	Basin Plan	Aquatic life habitat
Fecal Coliform	< 400	mpn/ 100 ml	Basin Plan	Water contact recreation (REC-1) (wet weather suspension in Ballona Creek, Los Angeles River, Coyote Creek, San Gabriel River, Dominguez Channel)[1]

[1] Wet weather suspension applies to 2008-09Event06, 2008-09Event09, and 2008-09Event21

Category 1 Numeric Objectives Used to Evaluate Attainment of Water Quality Standards (Continued)

Constituent	Numeric Objective	Unit	Reference	Beneficial Use
Ammonia	0.7 - 5 (COLD) 0.9 - 30 (WARM)	mg/L	Basin Plan	Aquatic life habitat (acute exposure only)
Cyanide	0.022	mg/L	CTR	
Dissolved Arsenic	340	µg/L	CTR	
Dissolved Cadmium	1 - 24	µg/L	CTR	
Dissolved Chromium +6	16	µg/L	CTR	
Dissolved Chromium	180 - 2,050	µg/L	CTR	
Dissolved Copper	4 - 61	µg/L	CTR	
Dissolved Lead	14 - 350	µg/L	CTR	
Dissolved Nickel	150 - 1,800	µg/L	CTR	
Dissolved Silver	0.3 - 60	µg/L	CTR	
Dissolved Zinc	40 - 450	µg/L	CTR	
Total Mercury	0.051	µg/L	CTR	Human health (fish consumption only)

Some constituents have water quality objectives based on municipal water supply (MUN), which is a conditional beneficial use in all monitored watersheds. For this reason, the water quality objectives applicable to MUN are included in Category 2, and are not used to compare monitoring results to water quality objectives.

Some constituents have chronic water quality objectives which are based on 4-day average exposures. Each measurement of this program is either based on a grab or a 24-hour composite sample. Therefore, chronic objectives are also included in Category 2 and are not used for comparison of monitoring data to water quality objectives.

Mass Emission Stations Water Quality Objectives Attainment

The table below sets forth all constituents for which one exceedance or more was measured at the mass emission stations during the 2008-2009 monitoring year. In urban watersheds (Ballona Creek, Los Angeles River, Dominguez Channel), an exceedance of copper and zinc was measured in at least one wet weather sampling event and an exceedance of fecal coliform was measured in at least one dry weather sampling event. Fecal coliform exceedances were found in almost all wet weather events in urban watersheds; some of these events (2008-09Event06, 2008-09Event09, and 2008-09Event21) were subject to the wet weather suspension of REC-1 beneficial uses. An exceedance of pH was measured in dry weather sampling events in the Los Angeles River and Dominguez Channel watersheds and cyanide was measured in at least one dry weather sampling event in the Los Angeles River watershed.

In the Malibu Creek, Santa Clara River, and San Gabriel River, watersheds, exceedances of fecal coliform were measured in wet weather sampling events. In the San Gabriel River and Santa Clara River watersheds exceedances of fecal coliform were measured in at least one dry weather sampling event. In the Malibu Creek watershed, exceedances of sulfate and TDS were measured in at least one wet weather sampling event, and exceedances of sulfate were measured in dry weather sampling events. In the San Gabriel watershed, exceedances of pH and chloride were measured in at least one dry weather sampling event. In the Coyote Creek watershed exceedances of fecal coliform were measured during wet weather events. An exceedance of pH and fecal coliform were found during at least one dry weather event.

An exceedance of total mercury was reported in at least one wet or dry weather sampling event for some of these watersheds, but the mercury exceedances reported are believed to be due to bias added by the analytical method used.

Summary of Constituents Not Attaining Water Quality Objectives at Least Once at Mass Emission Stations During 2008–2009.

More urbanized watersheds are indicated with italics.

Watershed / Tributary	Wet	Dry
Ballona Creek (S01)	Fecal coliform Dissolved copper Dissolved zinc Total mercury*	Fecal coliform Total mercury*
Malibu Creek (S02)	Fecal coliform Sulfate TDS Total mercury*	Sulfate Total mercury*
Los Angeles River (S10)	Fecal coliform Dissolved copper Dissolved zinc	pH Cyanide Fecal coliform
Coyote Creek (S13)	Fecal coliform	pH Fecal coliform
San Gabriel River (S14)	Fecal coliform Total mercury*	pH Fecal coliform Chloride TDS
Dominguez Channel (S28)	Fecal coliform Dissolved copper Dissolved zinc Total mercury*	pH Fecal coliform
Santa Clara River (S29)	Fecal coliform	Fecal coliform

*Believed to be due to bias added by the analytical method.

ES.2.1.1.2 Detection Limit Analysis

The monitoring and reporting requirements of the permit state that constituents monitored at mass emissions stations which are below the detection limit for 75 percent of the first 48 events monitored need not be further analyzed, except for annual confirmation sampling during the first storm of the wet season. A review of the data from 2006 to 2009 showed a significant number of organic constituents that were measured at least 17 times and as many as 22 times, and not detected at the method detection limit. Most of the constituents in the table below have been monitored since 2003. Therefore, a careful review of the historic data going back to 2003 may reveal that the number of measurements is close to, if not already over, the threshold needed to justify reduced monitoring frequency.

ES.2.1.2 Water Column Toxicity Monitoring

Water column toxicity monitoring was performed at all mass emission sites in accordance with the Municipal Stormwater Permit. In total, four samples were analyzed for toxicity at each site. Dry weather samples were collected on January 13, 2009 (2008-09Event15), and March 24, 2009 (2008-09Event30). Wet-weather samples were collected during the first rain event of the season on November 4, 2008 (2008-09Event03) for all Mass Emission Stations, except Santa Clara River, and on November 25, 2008 (2008-09Event06) only for Santa Clara River, and during another rain event on February 5, 2009 (2008-09Event21), at all mass emission sites. The results obtained from these samples are found in Table 4-6a and Table 4-6b, respectively. A minimum of one freshwater and one marine species was used for toxicity testing, specifically *Ceriodaphnia dubia* (*C. Dubia*) (water flea) seven-day reproduction/survival and *Strongylocentrotus purpuratus* (*S. purpuratus*) (sea urchin) fertilization.

The following conclusions were deduced from the water column toxicity testing:

- Water flea survival was affected by exposure to the first dry-weather sample collected from the Ballona Creek mass emission site on January 13, 2009 (2008-09Event15). Exposure to a concentration of 31.25% storm water caused a 25% reduction in a sublethal biological measurement of the test organisms, such as immobility. However, greater than 100% storm water would be needed to cause a 50% reduction. This suggests a nonlinear relationship between the potency of storm water and biological inhibition. Nevertheless, all mass emission sites had TU values less than 1.00 (Survival and Reproduction) for both dry weather events. Therefore, no Phase I TIE tests were required. Sea urchin fertilization was adversely affected by exposure to the dry-weather samples collected during both events. NOECs ranged from 6% during the first dry-weather event to 55.2% during the second dry-weather event, and TUs ranged from <1.00 to 2.41. Toxscan, Inc. (an affiliate of Kinnetic Laboratories, Inc.) analyzed the samples from the first dry-weather event. They reported by telephone to the LACFCD that the highest testable concentration due to the addition of hypersaline brine to the test organisms was about 50%. It was later learned by the LACFCD that addition of hypersaline brine is preferred over using sea salts on a 100% effluent concentration as the sea salts are toxic to embryos in the fertilization test. Given that, Kinnetic Laboratories, Inc. asserted that current science in this field indicates that a TU value greater than or equal to 2.00 would reasonably indicate substantial toxicity and warrant a Phase I TIE test. Therefore, no Phase I TIE tests were run for any samples from the first dry-weather event.

The same principle was applied to the test results for the second dry-weather event. Those samples were analyzed by Nautilus Environmental Laboratories. Only one sample, Los Angeles River, was found to be substantially toxic, i.e. TU was equal to 2.41. Phase I TIE manipulations strongly suggested that trace metals were the primary constituent of toxicity. Water flea survival and reproduction were adversely affected by exposure to the wet-weather samples collected from several mass emission sites during the first wet-weather event, according to the IC25 and IC50 values. IC25 values ranged from 28.13 to 100%, and IC50 values ranged from 86.54 to 100%. A NOEC of 50% was observed for organisms exposed to samples collected from Malibu Creek. ABC Laboratories reported TU values of 1.16, and 1.06, respectively, for Survival and Reproduction for that site. Despite the small nature of the first wet-weather event at these sites (rainfall amounts ranged from 0.12" to 0.44"), a sufficient volume of representative flow-weighted samples was collected and transported to the Los Angeles County Environmental Toxicology Laboratory to conduct the initial toxicity and Phase I TIE tests. Unfortunately, the Environmental Toxicology Laboratory did not transfer enough sample volume to ABC Laboratories, so the Phase I TIE tests could not be conducted. The LACFCD will remind the Environmental Toxicology Laboratory before each toxicity event to send enough sample water (typically 10 gallons) to the toxicity laboratories to conduct both tests. The TU values for Malibu Creek are highlighted in Table 4-6b.

- Sea urchin fertilization was adversely affected by exposure to the first wet-weather event samples collected at the Ballona Creek, Malibu Creek, Los Angeles River, Coyote Creek, and San Gabriel River sites on November 4, 2008 (2008-09Event03). NOECs of 50% or less were observed in organisms exposed to samples from those sites. These NOECS indicate that adverse effects were observed at half strength or less of storm water. The resulting TU values, which ranged from 2.20 to 3.29, are highlighted in Table 4-6b.

- ABC Laboratories analyzed samples from the above mentioned sites during several sampling events. Contrary to the practice of Kinnetic Laboratories and Nautilus Environmental, ABC Laboratories used sea salts to raise the salinity of the 100% sample solution to a level prescribed in the EPA test method. They were able to expose the test organisms to the 100% solution and the TU equation of 100/IC50 (or LC50) in the NPDES Municipal Permit was applied. Phase I TIE tests were warranted for the above mentioned samples. Despite the small nature of the first wet-weather event at these sites (rainfall amounts ranged from 0.12" to 0.44"), a sufficient volume of representative flow-weighted samples was collected and transported to the Los Angeles County Environmental Toxicology Laboratory to conduct the initial toxicity and Phase I TIE tests. Unfortunately, the Environmental Toxicology Laboratory did not transfer enough sample volume to ABC Laboratories, so the Phase I TIE test could not be conducted. The LACFCD will remind the Environmental Toxicology Laboratory before each toxicity event to send enough sample water (typically 10 gallons) to the toxicity laboratories to conduct both tests.

Kinnetic Laboratories conducted the toxicity tests on all samples for the second wet-weather event on February 5, 2009 (2008-09Event21). They followed their testing practice mentioned above. In agreement with that practice, none of the samples were determined to be substantially toxic. All TU values were less than 2.00. Therefore, no Phase I TIE tests were warranted.

ES.2.1.3 Tributary Monitoring

The purpose of tributary monitoring is to:

- Identify subwatersheds where stormwater discharges are causing or contributing to non-attainment of water quality standards.
- Prioritize drainage and subdrainage areas requiring management actions.

Sampling for the 2008-2009 season was conducted at six tributary monitoring stations in the Dominguez Channel Watershed. The tributaries monitored included:

- Project No. 1232 (TS19)
- PD 669 (TS20)
- Project Nos. 5246 & 74 (TS21)
- PD 21-Hollypark Drain (TS22)
- D.D.I. 8 (TS23)
- Dominguez Channel at 116th St. (TS24)

A total of five storm events, including the first storm of the season, and three dry events were sampled at each tributary monitoring site.

Tributary monitoring site Project No. 1232 is located on the northeast corner of Project 1232 and S. Main Street, south of Del Amo Boulevard, in the City of Carson. PD 669 is located in the south right-of-way of PD 669, on the southeast corner of Avalon Boulevard and PD 669, just north of Del Amo Boulevard in the City of Carson. Project Nos. 5246 & 74 is located north of Artesia Boulevard (State Route 91), east of Vermont Avenue, and is accessed from 169th Street to the west right-of-way of Project 5246 in the City of Los Angeles. PD 21-Hollypark Drain is located on the northeast corner of 135th Street at Dominguez Channel in the City of Gardena. D.D.I. 8 is located on the northwest corner of Dominguez Channel and the easterly prolongation of 132nd Street in the City of Gardena. Dominguez Channel at 116th Street is located at the corner of 116th Street and Isis Avenue in the City of Lennox.

The table below sets forth all constituents for which one exceedance or more was measured at the tributary monitoring stations during the 2008-2009 monitoring year. The exceedances were similar to those found at the Dominguez Channel mass emission station, except that pH exceedances were also measured in wet weather samples at each tributary monitoring station except PD 21-Hollypark Drain, dissolved copper was measured in dry weather sampling events at the Dominguez Channel at 116th monitoring station, and ammonia was detected in at least one dry weather sampling event at the Dominguez Channel at 116th monitoring station.

Fecal coliform exceedances were found in almost all wet weather events in the tributaries to Dominguez channel; some of these events (2008-09Event06, 2008-09Event09, and 2008-09Event21) were subject to the wet weather suspension of REC-1 beneficial uses.

An exceedance of total mercury was reported in at least one wet or dry weather sampling event for some of these tributary stations, but the reported measurement of mercury above the water quality objective is believed to be due to bias added by the analytical method used.

Summary of Constituents Not Attaining Water Quality Objectives at Least Once at Tributary Monitoring Stations During 2008–2009.

Watershed/Tributary	Wet	Dry
Project No. 1232 (TS19)	Fecal coliform pH Dissolved copper Dissolved zinc Total mercury*	pH Fecal coliform Total mercury*
PD 669 (TS20)	Fecal coliform pH Dissolved copper	pH Fecal coliform Total mercury*
Project Nos. 5246 & 74 (TS21)	Fecal coliform pH Dissolved copper Dissolved zinc Total mercury*	pH
PD 21-Hollypark Drain (TS22)	Fecal coliform Dissolved copper Dissolved zinc	pH Fecal coliform
D.D.I. 8 (TS23)	Fecal coliform pH Dissolved copper Dissolved zinc	pH
Dominguez Channel at 116th St. (TS24)	Fecal coliform pH Dissolved copper Dissolved zinc	pH Ammonia Dissolved copper

*Believed to be due to bias added by the analytical method used.

ES.2.1.3.1 Correlation Study for Sources for Constituents in Tributaries

A correlation analysis has been used to evaluate key questions related to constituent sources. Correlations with TSS are useful for characterizing the difference between highly urbanized and less urbanized watersheds as metal sources (copper, lead, and zinc). There was a strong correlation between most trace metals, such as copper and zinc, and TSS. However, mercury showed no correlation with TSS; this is an unexpected result, as total recoverable mercury typically is correlated with TSS in other watersheds. The lack of an apparent correlation between mercury and TSS led to closer scrutiny of the mercury data, and the initial conclusion that mercury results may be biased high due to the analytical method used. Selenium correlations with arsenic and sulfate suggest a common source, possibly from naturally occurring mineral formations leaching into groundwater that seeps into surface waters.

It was noted that in the tributary stations (TS19 – TS24), pH was significantly correlated with alkalinity. As discussed below, under sources, this is a natural and expected outcome based on the buffering capacity provided by calcium carbonate, magnesium carbonate, and other contributors to alkalinity. Low alkalinity caused by sudden storm flows can lead to low pH, while high alkalinity caused by seepage of heavily mineralized groundwater during dry periods when there is little dilution can lead to high pH.

ES.2.1.4 Shoreline Monitoring

The City of Los Angeles is required to monitor shoreline stations to evaluate the impacts to coastal receiving waters and impacts to recreational beneficial uses resulting from stormwater/urban runoff. Also, the Municipal Stormwater Permit requires the City of Los Angeles to annually assess shoreline water quality data and submit it to the LACFCD (Principal Permittee) for inclusion in the monitoring report. The City of Los Angeles' report is attached as Appendix D. Note that the Principal Permittee does not necessarily agree with all statements and conclusions presented by the City of Los Angeles.

ES.2.1.5 Trash Monitoring

The objectives of trash monitoring are to:

- Assess the quantities of trash in receiving waters after storm events; and
- Identify areas impaired for trash.

Visual observations of trash were made and a minimum of one photograph at each mass emission station was taken after six storm events including the first storm event, with the exceptions of Los Angeles River and Santa Clara River, which were photographed after five storm events.

Results of trash compliance monitoring for unincorporated Los Angeles County areas and for some cities in the Ballona Creek Watershed are included in Appendix I. Also included are results from the unincorporated Los Angeles County areas for the Los Angeles River watershed in Appendix J.

ES.2.2 Regional Monitoring

ES.2.2.1 Estuary Sampling

LACFCD has participated in the coastal ecology committee of the Bight 2003 project coordinated by the Southern California Coastal Waters Research Project (SCCWRP), in compliance with Section II.F of the Monitoring and Reporting Program of the stormwater monitoring requirements. The two primary objectives of Bight 2003 were to estimate the extent and magnitude of ecological change in the Southern California Bight and to determine the mass balance of pollutants within the Southern California Bight. Regional monitoring components included coastal ecology, shoreline microbiology, and water quality. This project has been conducted in collaboration with various organizations including regulators, wastewater and stormwater permittees, and citizen volunteers under the coordination of SCCWRP.

The goal of the Estuary Sampling program was to supplement the regional monitoring of the Southern California Bight estuarine habitats by sampling estuaries for sediment chemistry, sediment toxicity, and benthic macroinvertebrate diversity to determine the spatial extent of sediment affected by stormwater, and the magnitude of effects on benthic organisms. In the LACFCD, the estuaries sampled were those of Malibu Creek, Ballona Creek, Los Angeles River, San Gabriel River, and Dominguez Channel.

All reports pertinent to the Bight 2003 Project have been completed by SCCWRP and were released on their website Summer 2007.

The website address is: http://www.sccwrp.org/regional/03bight/03docs.html

ES.2.2.2 Bioassessment

Bioassessments aid in evaluating a water body's qualitative integrity through the detection of biological responses and trends resulting from exposure to pollution within watersheds. An ultimate goal is to identify probable causes of impairment not detected by chemical and physical water quality analysis. The LACFCD typically performs stream bioassessments in the County of Los Angeles in October every year as required in Section II.G of the Monitoring and Reporting Program of the Municipal Stormwater Monitoring Permit. However, in 2008, bioassessment monitoring was performed in June (for San Gabriel River Watershed) and in November (for other watersheds). Sampling sites are spread throughout each of the six major watersheds and are selected to represent the diverse environments of the Los Angeles region. Table 1-1 lists the sampling station locations and Figure 1-1 is a map showing the geographical location of the sampling stations. In 2008, bioassesment monitoring was conducted at 17 sites.

The State's Surface Water Ambient Monitoring Program will take information gathered from the biological surveys in the County and combine it with data collected from surrounding counties to refine an index of biological indicators for the Southern California region. The final report for the most recent year of the Bioassessment Monitoring Program (2008) is included in Appendix H.

Some program findings included:

- Taxonomic evaluation yielded 99 different taxa from 10,353 individual organisms. The most abundant organisms collected throughout the county were midges of the family Chironomidae, which were present at every monitoring site. The majority of organisms collected from the monitoring sites were moderately or highly tolerant to stream impairments.

- Thirteen of the 18 sites were dominated by organisms in the collector–gatherer feeding group, all of which were located in the lower elevation urbanized areas of the watersheds.

- The IBI score of a monitoring reach is considered the strongest analytical tool for rating overall benthic community quality. Sites rated Poor and Very Poor have an IBI score of 26 or lower (0–70 scale) and are considered impaired. The IBI scores for the 2008 study ranged from one to 55, out of a possible 70 points, and the quality of benthic macroinvertebrate communities were rated from Very Poor to Good.

- The monitoring reaches located in highly modified, concrete-lined channels had IBI ratings of Very Poor.
- Analysis of individual metrics as well as total IBI scores showed that monitoring sites located in the lower elevation watershed areas had lower-quality benthic communities than sites located in the mid to upper reaches of the watersheds.
- A simple correlation analysis of elevation and IBI scores indicated a significant and positive correlation between the two.
- 2008 did not indicate any substantial trend towards degradation or improvement at any of the sites.

ES.3 SPECIAL STUDIES

LACFCD has conducted the following special monitoring programs as required by the 2001 Municipal Stormwater Permit:

ES.3.1 New Development Impacts Study in the Santa Clara Watershed

The objective of the New Development Impacts Study in the Santa Clara Watershed is to evaluate the effectiveness of the Standard Urban Stormwater Mitigation Plan (SUSMP) BMPs at reducing pollutants in stormwater runoff.

The Permit originally required the LACFCD, with support from the City of Santa Clarita, to sample stormwater runoff in two similar watersheds, one developed with SUSMP and the other without. After failing to find two similar catchments developed with and without SUSMP guidelines, the Los Angeles Regional Water Quality Control Board (LARWQCB), in a letter dated March 7, 2003, allowed the LACFCD and the City of Santa Clarita to fulfill this permit requirement by simulating the expected improvements from implementation of SUSMP through mathematical modeling. On November 13, 2003, we submitted a work plan for the modeling to the LARWQCB. The USEPA's Stormwater Management Model was used to conduct a deterministic hydrological modeling coupled with a stochastic Monte Carlo approach for modeling stormwater runoff water quality. A small watershed tributary to the Santa Clara River in the western side of the City of Santa Clarita was selected for the modeling. The 160-acre drainage area of this pre-SUSMP site includes a mix of residential, commercial, transportation, and open space land uses.

The final report for this project was submitted to the LARWQCB on April 7, 2008.

ES.3.2 Peak Discharge Impact Study

The study was conducted to fulfill the requirement to develop numeric criteria for peak flow control by assessing the potential cause and effect relationships between urbanization in watersheds and stream erosion in the LACFCD.

An Executive Summary from the study results was included in Appendix B of the 1994-2005 Integrated Receiving Water Impacts Report. The Executive Summary can be found at http://ladpw.org/wmd/NPDES/1994-05_report/contents.html

ES.3.3 Best Management Practices Effectiveness Study

Sampling of all BMPs in the BMP Effectiveness Study was completed in the 2006–2007 season.

ES.4 RECOMMENDATIONS

The recommendations are organized around specific types of actions (e.g., monitoring improvements, source assessments).

ES.4.1 Monitoring Methods

Several recommendations for improving monitoring techniques result from this analysis. As they are recommended monitoring changes, they could be initiated by LACFCD, after appropriate consultation with the LARWQCB and Copermittees:

- Consideration could be given to whether a mercury analytical method with an appropriately low detection limit, such as USEPA method 1631 should be used to ensure accurate results.

- Although selenium does not have a Category 1 objective for comparison, the chronic (Category 2) objective in Malibu Creek may require a change in analytical methods. Consideration could be given to whether future analyses of selenium by USEPA method 200.8 (inductively coupled mass spectrometry) should specify use of interference-reduction technologies (USEPA, 2007). These new technologies, referred to by manufacturers as “collision cells” or “dynamic reaction cells” have been proven to eliminate high bias in the measurement of selenium.

ES.4.2 Source Investigations

Several recommendations for source investigations can be made based on the results and discussion presented above. However, the responsibility for carrying out the source investigations needs to be determined. Therefore, the appropriate next step on these items is for the LARWQCB to contact the appropriate stakeholder to carry out the source investigations.

- A review of existing monitoring programs within the Malibu Creek Watershed should be conducted to determine potential sources of sulfate and selenium.

- To address trace metals, such as copper and zinc, in the Dominguez Channel, the next logical step is to conduct another year of tributary sampling in the Dominguez Channel watershed.

- In the Ballona Creek and the Los Angeles River watersheds, existing monitoring programs should address sources that increase metal concentrations in sediments transported by stormwater.

ES.4.3 Information Development

Information development activities can be carried out by LACFCD through completion of future reports and discussions with the LARWQCB and stakeholders.

- Consideration could be given to how MUN water quality objectives are to be implemented where MUN is a conditional use.

- The LARWQCB should review the EPA test method for estimating chronic toxicity of effluents and receiving waters to west coast marine and estuarine organisms, and current science in that field, and issue guidance on whether or not to use sea salts in the high effluent percentage test solution. Two of the three laboratories who conducted toxicity tests asserted that sea salts are themselves toxic to embryos in the sea urchin fertilization toxicity test.

- If use of hypersaline brine is the preferred methodology to sea salts for toxicity testing, then the LACFCD recommends that the LARWQCB issue new guidance on the applicable value of the Toxic Unit to use to indicate that a sample is substantially toxic. All three laboratories who conducted toxicity tests asserted that a value greater than or equal to 2.00 is most appropriate and will reasonably lead to conclusive Phase I TIE test results.

ES.5 BEST MANAGEMENT PRACTICES IMPLEMENTATION

Discussion of BMP implementation is not possible in this Annual Monitoring Report. Long term trends will need to be determined and analyzed prior to making any management decisions regarding BMP implementation.